

CLAIMS

We claim:

5 1. A detection system for a bio-separation device having a plurality of separation channels in which bio-separation takes place simultaneously, comprising:

Sub R3
a detection section along each separation channel defining a detection zone for analytes;

a plurality of radiation sources, each associated with a separation channel;

10 excitation means for introducing excitation radiation from the radiation sources at the detection zones as analytes pass the detection zones;

detecting means for detecting radiation emissions;

control means for controlling the radiation sources and detecting means in a manner such that excitation radiation is introduced at the detection zone of each separation

15 channel in a predetermined sequence and radiation emission from the detection zone of each separation channel is detected in a time staggered/multiplexed manner.

20 2. The detection system as in claim 1, wherein the detecting means comprises a single detector associated with a plurality of radiation sources.

3. The detection section as in claim 1, wherein the control means controls the plurality radiation sources to activate in successive pulses between radiation sources.

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4. The detection section as in claim 3, wherein the control means controls the synchronization of pulsing of the radiation sources and detection sampling rate and period by taking into account the lag time in emitted radiation in adjacent separation channels, whereby desired detection for a separation channel covers a period when only the associated radiation source is on with respect to the detecting means.

5. The detection system as in claim 4, wherein the control means controls the detecting means to sample radiation emissions from the multiple separation channels at a rate and period that provide desired radiation emission signal separation between separation channels to reduce cross talk.

6. The detection system as in claim 1, wherein the control means controls the detecting means and radiation sources in a manner to effect detection of radiation emissions from the multiple separation channels in predetermined detection cycles, wherein each detection cycle is repeated at a frequency to provide a desired detection resolution.

7. The detection system as in claim 1, wherein the control means controls the radiation sources and detecting means in a manner to effect detection in a repeated scanning manner, across the detection zones of the separation channels.

8. The detection system as in claim 1, wherein the radiation sources produces excitation radiation at more than one wavelength.

9. The detection system as in claim 1 wherein the analytes comprise a material that fluoresces in the presence of the excitation radiation, and the detecting means comprises means for detecting fluorescence emission of the material.

5 10. The detection system as in claim 1 wherein the radiation emission is at least one of:

fluorescence;
chemiluminescence; and
phosphorescence.

10 11. A bio-separation instrument, comprising:
a plurality of separation channels;
means for simultaneously separating samples in the separation channels into analytes; and

15 a detection system, comprising:

a detection section along each separation channel defining a detection zone for analytes;

a plurality of radiation sources, each associated with a separation channel;
excitation means for introducing excitation radiation from the radiation

20 sources at the detection zones as analytes pass the detection zones;

detecting means for detecting radiation emissions;

control means for controlling the radiation sources and detecting means in a manner such that excitation radiation is introduced at the detection zone of each separation channel in a predetermined sequence and radiation emission from the

detection zone of each separation channel is detected in a time
tagged/multiplexed manner.

12. A bio-separation instrument as in claim 11, wherein the separation channel is
defined by a capillary column, and the means for separating a sample is configured to
effect separation of the sample by electrophoresis.

13. A method for detecting analytes in a bio-separation device having a plurality
of separation channels in which bio-separation takes place simultaneously, comprising
the steps of:

defining a detection zone for analytes along each separation channels;

providing a plurality of radiation sources, each associated with a separation
channel;

introducing excitation radiation from a plurality radiation sources at the detection
zones as analytes pass the detection zones;

providing a detector for detecting radiation emissions;

controlling the radiation sources and detector in a manner such that excitation
radiation is introduced at the detection zone of each separation channel in a
predetermined sequence and radiation emission from the detection zone of each
separation channel is detected in a time staggered/time-multiplexed manner.